

# **SEWING MACHINE**

## **BACKGROUND OF THE INVENTION**

### **1. Field of the Invention**

The present invention relates to a sewing machine, and more particularly to a sewing machine having a cutting mechanism that is operated rigidly and stably, thereby facilitating the user operating the sewing machine.

### **2. Description of the Related Art**

A conventional sewing machine comprises a fixed lower cutter, and an upper cutter mounted on a support seat and movable relative to the lower cutter. The support seat is moved horizontally and vertically so as to adjust the position of the upper cutter. However, the support seat cannot support the upper cutter rigidly and stably, so that the upper cutter easily vibrates during movement, thereby decreasing the working efficiency. In addition, the lower cutter is not positioned exactly, so that when the upper cutter touches the lower cutter to cut the cloth, the lower cutter is easily deflected, thereby affecting quality of the cloth.

## **SUMMARY OF THE INVENTION**

The present invention is to mitigate and/or obviate the disadvantage of the conventional sewing machine.

The primary objective of the present invention is to provide a sewing machine, wherein the support rod is extended through the passage hole of the actuating member and the support hole of the support bracket, so that support

1 rod and the upper cutter are supported by the actuating member and the support  
2 bracket rigidly and stably, thereby enhancing efficiency of operation of the  
3 upper cutter.

4 Another objective of the present invention is to provide a sewing  
5 machine, wherein the support rod is supported by the actuating member and  
6 the support bracket, and the restoring spring is urged between the retaining  
7 member and the actuating member, so that the whole length of the support rod  
8 is shortened efficiently, thereby simplifying the construction of the sewing  
9 machine.

10 A further objective of the present invention is to provide a sewing  
11 machine, wherein the whole length of the support rod is shortened efficiently,  
12 thereby reducing shock or vibration during adjustment of the support rod,  
13 thereby enhancing stability of operation of the upper cutter.

14 A further objective of the present invention is to provide a sewing  
15 machine, wherein the actuating member of the driving device and the main  
16 frame form a parallel four-link structure, so that the upper cutter and the  
17 actuating member are constantly moved upward and downward in a parallel  
18 manner, thereby exactly maintaining the optimum angle between the upper  
19 cutter and the lower cutter.

20 A further objective of the present invention is to provide a sewing  
21 machine, wherein the fixing seat has mediate portion fixed on the support shaft  
22 and a lower end mounted on the second pivot shaft of the main frame, thereby

1 forming a resistant force structure having a longer moment, so that when the  
2 upper cutter intersects the lower cutter to cut the cloth, the upper cutter and the  
3 lower cutter are kept at the optimum stable state for cutting the cloth.

4 A further objective of the present invention is to provide a sewing  
5 machine, wherein the upper cutter, the support rod, the lower cutter and the  
6 fixing seat are support rigidly and stably, thereby reducing hit, shock or  
7 vibration during operation of the sewing machine, thereby enhancing stability  
8 of operation of the sewing machine, and thereby increasing the lifetime of the  
9 sewing machine.

10 In accordance with one embodiment of the present invention, there is  
11 provided a sewing machine, comprising:

12 a main frame provided with a drive shaft; and

13 a cutting mechanism mounted on the main frame and including:

14 a driving device including an actuating member driven by the drive  
15 shaft of the main frame;

16 a first retaining device including a support bracket secured on and  
17 spaced from the actuating member, a support rod driven by the actuating  
18 member of the driving device and having a first end extended through the  
19 actuating member and the support bracket, an upper cutter mounted on a  
20 second end of the support rod to move therewith, a retaining member secured  
21 on the first end of the support rod and rested on the support bracket, a restoring

1 spring mounted on the support rod and urged between the retaining member  
2 and the actuating member; and

3 a second retaining device including a lower cutter located opposite to  
4 the upper cutter of the first retaining device.

5 In accordance with another embodiment of the present invention,  
6 there is provided a sewing machine, comprising:

7 a main frame provided with a drive shaft; and

8 a cutting mechanism mounted on the main frame and including:

9 a driving device driven by the drive shaft of the main frame;

10 a first retaining device including an upper cutter driven by the  
11 driving device; and

12 a second retaining device including a support shaft having a first end  
13 extended through a wall of the main frame, a fixing seat having a mediate  
14 portion secured on a second end of the support shaft and a lower end mounted  
15 on a pivot shaft of the main frame, and a lower cutter secured on an upper end  
16 of the fixing seat and located opposite to the upper cutter of the first retaining  
17 device.

18 In accordance with a further embodiment of the present invention,  
19 there is provided a sewing machine, comprising:

20 a main frame provided with a drive shaft; and

21 a cutting mechanism mounted on the main frame and including:

1 a driving device driven by the drive shaft of the main frame and  
2 including a drive member having an upper end mounted on the drive shaft of  
3 the main frame, a first power transmission member having a first section  
4 pivotally mounted on a lower end of the drive member and a mediate section  
5 pivotally mounted on a pivot axle of the main frame, a link having a first end  
6 pivotally mounted on a second section of the first power transmission member,  
7 a second power transmission member having a first section pivotally mounted  
8 on a second end of the link and a mediate section pivotally mounted on a pivot  
9 shaft of the main frame, and an actuating member having a lower end pivotally  
10 mounted on a second section of the second power transmission member;

11 a first retaining device including an upper cutter driven by the  
12 actuating member of the driving device; and

13 a second retaining device including a lower cutter located opposite to  
14 the upper cutter of the first retaining device.

15 Further benefits and advantages of the present invention will become  
16 apparent after a careful reading of the detailed description with appropriate  
17 reference to the accompanying drawings.

## 18 **BRIEF DESCRIPTION OF THE DRAWINGS**

19 Fig. 1 is a perspective view of a sewing machine in accordance with  
20 the preferred embodiment of the present invention;

21 Fig. 2 is a partially cut-away perspective view of the sewing machine  
22 in accordance with the preferred embodiment of the present invention;

Fig. 3 is an exploded perspective view of the sewing machine in accordance with the preferred embodiment of the present invention;

Fig. 4 is a partially cut-away perspective view of the sewing machine in accordance with the preferred embodiment of the present invention;

Fig. 5 is a partially cut-away plan cross-sectional view of the sewing machine as shown in Fig. 4; and

Fig. 6 is a plan operational view of the sewing machine as shown in Fig. 2.

### **DETAILED DESCRIPTION OF THE INVENTION**

Referring to the drawings and initially to Figs. 1-3, a sewing machine in accordance with the preferred embodiment of the present invention comprises a main frame 11, a cantilever 12 mounted on a top of the main frame 11, and a cutting mechanism "A" mounted on the main frame 11 for cutting the cloth. The main frame 11 is provided with a drive shaft 13 for driving the cutting mechanism "A".

The cutting mechanism "A" includes a first retaining device 30 having an upper cutter 31, a second retaining device 40 having a lower cutter 41, and a driving device 20 driven by the drive shaft 13 of the main frame 11 to drive the upper cutter 31 of the first retaining device 30.

In such a manner, the first retaining device 30 can so-operate with the second retaining device 40, so that the upper cutter 31 of the first retaining

1 device 30 and the lower cutter 41 of the second retaining device 40 are  
2 supported rigidly and stably by multiple support points.

3 The main frame 11 has a wall provided with a pivot axle 110, a first  
4 pivot shaft 111 and a second pivot shaft 112 for mounting the driving device 20,  
5 the first retaining device 30 and the second retaining device 40.

6 Referring to Figs. 1-6, the driving device 20 includes a drive member  
7 21 having an upper end mounted on the drive shaft 13 of the main frame 11 by  
8 a fixing member 22, a substantially inverted L-shaped first power transmission  
9 member 23 having a horizontal section pivotally mounted on a lower end of  
10 the drive member 21 and a mediate section pivotally mounted on the pivot axle  
11 110 of the main frame 11 by a fixing member 230, a horizontal link 24 having a  
12 first end pivotally mounted on a vertical section of the first power transmission  
13 member 23, a substantially inverted L-shaped second power transmission  
14 member 25 having a vertical section pivotally mounted on a second end of the  
15 link 24 and a mediate section pivotally mounted on the first pivot shaft 111 of  
16 the main frame 11 by a fixing member 250, and an elongated actuating member  
17 26 having a lower end pivotally mounted on a horizontal section of the second  
18 power transmission member 25. The lower end of the actuating member 26 is  
19 formed with a pivot hole 260, and a pivot pin 27 is extended through the  
20 horizontal section of the second power transmission member 25 and is  
21 pivotally mounted in the pivot hole 260 of the lower end of the actuating  
22 member 26. In addition, the fixing member 22 is fixed on the drive shaft 13 of

1 the main frame 11 to rotate therewith, and the drive member 21 is moved on  
2 the fixing member 22 to perform a cam movement.

3 The actuating member 26 has a mediate portion formed with a  
4 threaded fixing hole 261 located above the pivot hole 260 and a positioning  
5 hole 262 located above the fixing hole 261 and an upper end formed with a  
6 passage hole 263 located above the positioning hole 262.

7 The first retaining device 30 includes a substantially L-shaped  
8 support bracket 35 having a horizontal section secured on the mediate portion  
9 of the actuating member 26, a support rod 32 having a first end extended  
10 through the passage hole 263 of the actuating member 26 and a vertical section  
11 of the support bracket 35 and a second end formed with an enlarged head 320  
12 rested on the upper end of the actuating member 26 for mounting a lower end  
13 of the upper cutter 31, an annular retaining member 34 secured on the first end  
14 of the support rod 32 and rested on the vertical section of the support bracket  
15 35, and a restoring spring 33 mounted on the support rod 32 and urged between  
16 the retaining member 34 and a wall of the passage hole 263 of the actuating  
17 member 26.

18 The enlarged head 320 of the support rod 32 of the first retaining  
19 device 30 is formed with a positioning recess 321 for positioning the lower end  
20 of the upper cutter 31 by an adjusting screw 311. In addition, the lower end of  
21 the upper cutter 31 is formed with an oblong adjusting slot 310 for slidably  
22 mounting the adjusting screw 311.



1           The retaining member 34 of the first retaining device 30 is formed  
2   with a central hole 340 for mounting the support rod 32. The vertical section of  
3   the support bracket 35 has an upper end formed with a support hole 353 for  
4   mounting the support rod 32 and two retaining holes 354 surrounding the  
5   support hole 353, the retaining member 34 has a periphery formed with a  
6   retaining hole 341, and the first retaining device 30 further includes a retaining  
7   pin 342 having a first end secured in the retaining hole 341 of the retaining  
8   member 34 and a second end secured in one of the two retaining holes 354 of  
9   the support bracket 35.

10           The horizontal section of the support bracket 35 has a bent end  
11   formed with a fixing hole 350, and the first retaining device 30 further includes  
12   a locking screw 351 extended through the fixing hole 350 of the support  
13   bracket 35 and screwed into the fixing hole 261 of the actuating member 26, so  
14   that the horizontal section of the support bracket 35 is fixed on the mediate  
15   portion of the actuating member 26. Thus, the support bracket 35 is integrally  
16   combined with the actuating member 26, so that the support bracket 35 is  
17   moved with the actuating member 26 synchronously.

18           The first retaining device 30 further includes a follower 37 having a  
19   first end pivotally mounted between the support bracket 35 and the actuating  
20   member 26 by a positioning shaft 36, and a second end pivotally mounted on  
21   the second pivot shaft 112 of the main frame 11 by a fixing member 38.

1           In such a manner, the main frame 11, the actuating member 26, the  
2 second power transmission member 25 and the follower 37 form a parallel  
3 four-link structure, so that the actuating member 26 is moved upward and  
4 downward in a parallel manner.

5           The vertical section of the support bracket 35 has a lower end formed  
6 with a fixing hole 352, and the positioning shaft 36 has a threaded first end 360  
7 extended through the fixing hole 352 of the support bracket 35 and screwed by  
8 two locking nuts 362. In addition, the positioning shaft 36 has a smooth second  
9 end 362 extended through the first end of the follower 37 and secured in the  
10 positioning hole 262 of the actuating member 26, so that the follower 37 is  
11 pivotally mounted on the positioning shaft 36.

12           The second retaining device 40 includes a support shaft 43 having a  
13 first end 44 extended through a wall of the main frame 11 and a second end  
14 formed with a positioning recess 430, a knob 45 fixed on the first end 44 of the  
15 support shaft 43, a fixing seat 42 having an upper end for fixing the lower  
16 cutter 41 by screws 410, a mediate portion formed with a through hole 420 and  
17 a lower end 422 formed with a mounting hole 423 mounted on the second pivot  
18 shaft 112 of the main frame 11, and a locking screw 421 extended through the  
19 through hole 420 of the fixing seat 42 and screwed into the positioning recess  
20 430 of the support shaft 43.

21           In such a manner, when the upper cutter 31 of the first retaining  
22 device 30 and the lower cutter 41 of the second retaining device 40 touch each

1 other, the through hole 420 of the fixing seat 42 forms the fulcrum of a resistant  
2 force, and the mounting hole 423 of the fixing seat 42 forms a resistant  
3 moment of a longer distance, thereby enhancing stability of the lower cutter 41  
4 and the fixing seat 42 of the second retaining device 40 when cutting the cloth  
5 rim.

6 Accordingly, the sewing machine in accordance with the preferred  
7 embodiment of the present invention has the following advantages.

8 1. The support rod 32 is extended through the passage hole 263 of the  
9 actuating member 26 and the support hole 353 of the support bracket 35, so  
10 that support rod 32 and the upper cutter 31 are supported by the actuating  
11 member 26 and the support bracket 35 rigidly and stably, thereby enhancing  
12 the efficiency of operation of the upper cutter 31.

13 2. The support rod 32 is supported by the actuating member 26 and  
14 the support bracket 35, and the restoring spring 33 is urged between the  
15 retaining member 34 and the actuating member 26, so that the whole length of  
16 the support rod 32 is shortened, thereby simplifying the construction of the  
17 sewing machine.

18 3. The whole length of the support rod 32 is shortened efficiently,  
19 thereby reducing shock or vibration during adjustment of the support rod 32,  
20 thereby enhancing stability of operation of the upper cutter 31.

21 4. The actuating member 26 of the driving device 20 and the main  
22 frame 11 form a parallel four-link structure, so that the upper cutter 31 and the

1 actuating member 26 are constantly moved upward and downward in a parallel  
2 manner, thereby exactly maintaining the optimum angle between the upper  
3 cutter 31 and the lower cutter 41.

4 5. The fixing seat 42 has mediate portion fixed on the support shaft  
5 43 and a lower end 422 mounted on the second pivot shaft 112 of the main  
6 frame 11, thereby forming a resistant force structure having a longer moment,  
7 so that when the upper cutter 31 intersects the lower cutter 41 to cut the cloth,  
8 the upper cutter 31 and the lower cutter 41 are kept at the optimum stable state  
9 for cutting the cloth.

10 6. The upper cutter 31, the support rod 32, the lower cutter 41 and the  
11 fixing seat 42 are support rigidly and stably, thereby reducing hit, shock or  
12 vibration during operation of the sewing machine, thereby enhancing stability  
13 of operation of the sewing machine, and thereby increasing the lifetime of the  
14 sewing machine.

15 Although the invention has been explained in relation to its preferred  
16 embodiment(s) as mentioned above, it is to be understood that many other  
17 possible modifications and variations can be made without departing from the  
18 scope of the present invention. It is, therefore, contemplated that the appended  
19 claim or claims will cover such modifications and variations that fall within the  
20 true scope of the invention.

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